

Experimental 430MHz Wire Antennas

Tony Martin G4XBY, has built two experimental collinear antennas for the 430MHz band, using lengths of wire and other basic materials. Although they're simple antennas, Tony says they should work well in any location.

The two antennas I'm going to describe came about from a series of experiments. But, I'm going to describe them individually.

The diagram in **Fig. 1**, shows the first experimental antenna. For this version, which is a $5\lambda/8$ over $5\lambda/8$ collinear antenna, you'll need a piece of hard drawn copper wire 1.5 metres in length.

Take the length of wire and straighten it out. But be warned, this isn't as easy a task as it sounds!

I've found the best method to straighten the wire out, is to start by fixing one end to something that won't move. Then, all you have to do, is ask someone to pull the other end as hard as possible, by leaning back and using their weight against it.

While this kind person is pulling, and the wire is under tension, you can be busily 'wiggling' the kinks and bends out by hand.

Vital Statistics

Now let's look at the vital statistics of the project. It's easy enough, as all the measurements are made from one end. You'll see I've marked this as point A in **Fig. 1**.

Mark all the points B-I out before you start. I

find a small triangular file provides one of the best methods of marking this wire, as it is rather hard. Make rings, or nicks (but not too deep) on the wire at the distances shown, taking care to measure everything accurately.

Bending Wire

You start by bending the wire at a right angle at point B, and trapping it against a length of 12.5mm (1/2 inch) dowelling. I use a self-gripping wrench for this job.

Keeping about 7mm between each turn, wind the wire in a clockwise direction around the dowelling as tightly as possible. After four turns, this should bring you to point C, which should be in line with the section A-B.

Now bend the wire, again at a right angle, to continue in the original direction. At point D, repeat the process with the dowel and pliers, to create a similar coil to above.

The next job we have to do, is form the 'J' match feed-line. From point E, make a mark at 178mm in the direction of point I. This is to become the centre line (mid way between G and H) of the 'u' bend at the bottom of the 'J' match section.

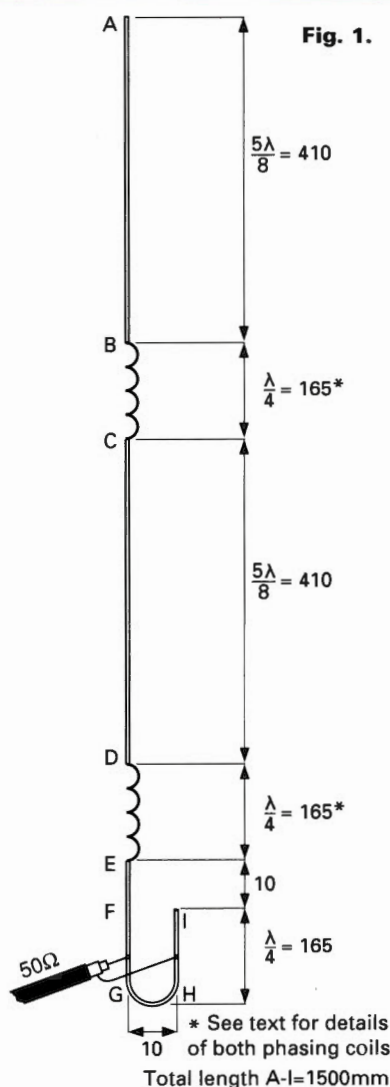


Fig. 1.

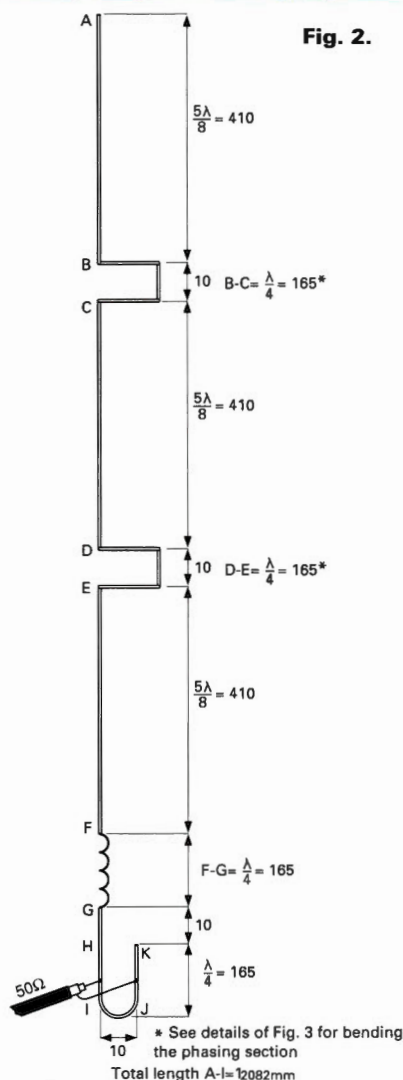


Fig. 2.

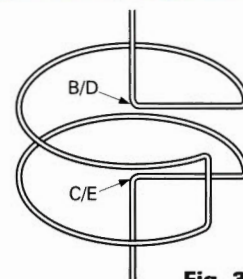


Fig. 3.

Fig. 1: Detailed constructional diagram of the first antenna project. See text for full details on setting-up and adjusting the matching of the coaxial cable feed to the antenna.

Fig. 2: Constructional details of the second antenna project. See text for setting-up the matching of the antenna to the coaxial cable feed-line.

Fig. 3: Constructional details of the preferred way of winding the coils for positions D-E and B-C on antenna project two. Coils wound using this method are less bulky, and the finished antenna is easier to fit into the plastics tube (see text for further details).

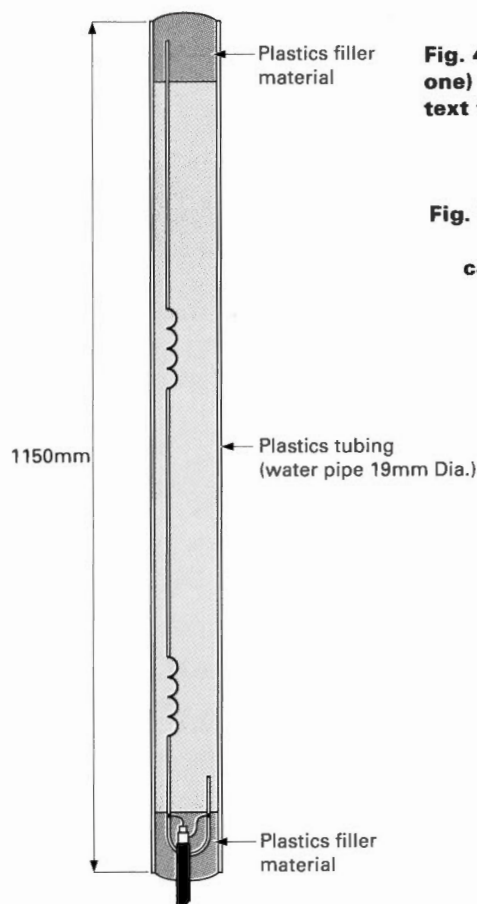
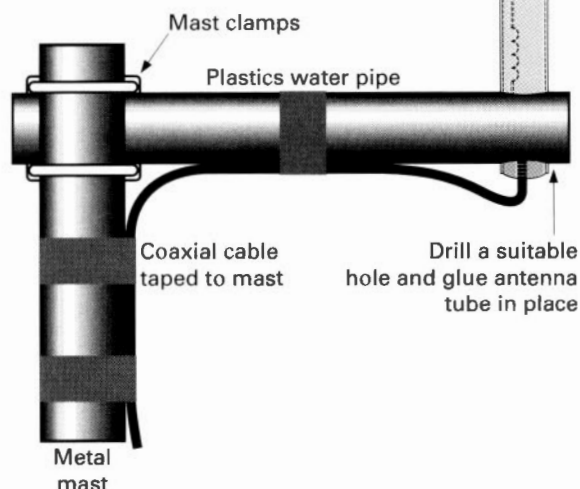


Fig. 4: Diagram showing the finished antenna (version one) fitted into a section of plastics water pipe. See text for suggestions regarding suitable materials.

Fig. 5: The completed antenna (either version) mounted in a length of plastics tubing and erected on a cantilever section made from the same material (see text).



Tuning Arrangements

The tuning arrangements are straightforward. Make up a 'patch' lead to fit your s.w.r. meter, using good quality crocodile clips on one end.

Ideally, the 'patch' lead should be an odd number of half wavelengths long at the centre working frequency of 434MHz. The free space $\lambda/2$ wavelength of 434MHz is 346mm. Taking the usual velocity factor of coaxial cable as 0.66, this would give a coaxial $\lambda/2$ as 228mm.

To start the tests, suspend the antenna from the ceiling (or somewhere out of the family's way!), using nylon mono-filament fishing line or similar. Don't forget to keep the antenna, as far away as possible from anything that might detune the system.

Next, you should attach the coaxial outer clip to the short side of the 'J' and the inner on the long side. Once this has been done, you can begin to adjust the feed-point to give the lowest s.w.r. reading possible.

It's not a difficult process, as long as you remember the following rule. And that golden rule is: keep both clips equal distances from their points G or H as you adjust the feed-point.

Potted Antenna

When you are happy with the s.w.r. measurements you've obtained from the antenna, solder a piece of 50 Ω coaxial cable to the same positions as the clips. Then check the s.w.r. again, to see that it's still low.

If all is well, the antenna may be 'potted' into a piece of plastics water pipe. This is not a difficult job, and it will provide a neat finish, as shown by the diagrams in Fig. 4 and 5.

Antenna Two

Having tackled the first project, I'll describe antenna two. As you've probably surmised, the second version I'm going to describe, is based on the first antenna.

Project number two is slightly different, as I've added another $5\lambda/8$ section to provide greater gain. This time, I've also altered the phasing arrangements between the upper two sections of the antenna.

Before you start, look at the diagram in Fig. 2 which is the linear diagram of the second project. The new phasing sections, comprising B-C and D-E are phasing lines, rather than phasing coils. I have retained a phasing coil for the lower section, between points F and G.

Same Methods

Using the same methods and techniques as described above, mark out the various distances from the reference (point A) as shown in Fig. 2. Once this has been completed, for the time being, just leave the two sections, B-C and D-E as shown in the diagram.

Next, beginning at point F, using the dowelling method I've already described, wind the section F-G into a four turn coil. The coil must be wound with about 7mm between the individual turns.

Repeat The Process

Now we have to repeat the bending process. This is done to form the 'J' match section, just as we did for the first antenna.

The next job is the bending of the two phasing lines. These two sections of the antenna are formed

as shown in the diagram in Fig. 3.

The diagram in Fig. 3 demonstrates the most compact method of bending the wire, and the overall diameter of the phasing section should be about 20mm. The antenna elements run centrally through the phasing sections.

Another method is to wind the whole section around a length of 25mm (one inch) dowelling to form an almost complete loop. However, this method is slightly less compact, and the loop formed is off to one side of the antenna, making the 'potted' project quite large in diameter.

Setting Up

As with the first antenna, we have to set up the feed-point to achieve the lowest s.w.r. possible at band centre, 434MHz. Once again, this is done by moving the feed-point on the 'J' match section so as to provide the lowest s.w.r. reading at 434MHz.

Note: There's an important point to remember, if the antennas are to be mounted on a metal pole, as shown in Fig. 5. When mounted in this way, you must make sure that the cross support plastics tube, is in-line with the feed-points on the 'J' match section of the antenna.

Radiation Pattern

I make no claims for the gain or radiation pattern. As the results achieved will vary between antennas, I only offer these designs as a basis of experimenting with antennas at u.h.f. frequencies.

Even though I've qualified my results, they've worked for me. In my location, using either antenna, I can gain access to repeaters that a 'Slim-Jim' design is unable to do under the same conditions.

These two projects are fun to build, cheap to make and they work. Go on, have a go yourself!

How Much? How Difficult

Around £5 Intermediate

Shopping List

Copper wire (see text), coaxial cable, crocodile clips, suitable length of 19mm plastics water pipe, mast clamps, plastics insulation tape, plastics filler material for sealing antenna into housing tube (fillers such as Plastic Padding, available at car accessory shops are suitable for this job, but make sure that the material you use is not loaded with metal and that it's not a conductor). **Warning: Many plastics filler materials give off inflammable vapours that can be dangerous in confined areas. Be safe, and follow the manufacturer's advice on where and how you mix the material.**

BARGAIN BASEMENT

Write your advertisement in BLOCK CAPITALS - up to a maximum of 30 words plus 12 words for your address - and send it together with your payment of £2.35, and corner flash or subscriber despatch label to: **Donna Vincent, PW Bargain Basement, Enefco House, The Quay, Poole, Dorset BH15 1PP.**

Subscribers must include the despatch label bearing their address and subscription number to qualify for their free advert.

Advertisements from traders, apparent traders or for equipment that is illegal to possess, use or which cannot be licensed in the UK, will not be accepted.

No responsibility will be taken for errors.

For Sale Panasonic RF-B65 short wave receiver. Features include 36 memories, b.f.o., scanning and l.c.d. display, c.w. soft case, a.c. p.s.u. and long wire. Boxed as new with manuals, £120 o.n.o. Tel: Ian (0354) 660800.

For Sale Realistic PRO-2004 scanner, 300 channels, 25-520MHz and 760-1300MHz. Excellent condition, £160 carriage free. Loss of interest forces sale. Tel: 091-567 4048.

For Sale 60ft tower, including winch, a home-brew tower in the same style as Versatower. Wall mount but can be converted to post mount. Needs tidying up and cleaning etc., £150 buyer collects. John G4HGT, Leeds. Tel: (0532) 873874.

For Sale Racal RA17L h.f. receiver v.g.c. with service manual. Steve, Essex. Tel: (0702) 296285 after 6.30pm.

For Sale Swan 350 transceiver, s.s.b., 3.5, 7.0, 14, 21 & 28MHz with power unit, mic, handbook, 400W p.e.p. Carriage paid. Tel: (0504) 49514.

Wanted Drake model DC-4 power supply. Your price and postage paid. P. Gater, NB Halcyon, Orchard Marina, School Road, Rudheath, Northwich, Cheshire.

Wanted Any coils for HRO receiver, mains p.s.u. and matching loudspeaker. Mounting base for BC-348-0 receiver's cabinet, Dynamotor DM28 and filter, two sprung loaded jack caps, any MCRI receiver coils. A. J. Humphriss. Tel: (0926) 400876.

For Sale Yaesu FT-290R11, 18 months old complete with NiCad batteries and carrying case, £275. Tel: (0684) 72860.

For Sale Masthead Amps, UHF CM7066, CM7271, v.h.f. fringe 1220-3, v.h.f. 40-230MHz, 12V p.s.u., £10 each item. DXTV D100 deluxe converter, bands 1, 2, 3, 4 & 5 bandwidth sound variable, £40. Sat dishes + mounts, 800mm, £40, 600mm, £20. Tel: (0278) 793917.

For Sale Realistic PRO-2001 v.h.f./u.h.f. scanner, 16 channel, very good condition, boxed with manual, £75. Tel: 051-487 5911.

For Sale Working PW49'er in-car short wave to medium wave converter for 6MHz band to specifications - see PW January 1990. Built for PW advertiser who 'backed down'. Fair price, £45. Tel: (0299) 826659.

For Sale Yaesu FT-102 a.t.u. very good condition, complete with instructions and cables, boxed, £150. G5RV antenna, £5. Tandy electronic reverberator, £5. G4ZSB. Tel: Nottingham (0602) 256389.

For Sale Three RCA 6146B, £22.50. Two GE

6146B, £15. Drae 4A power supply, £15. Two Eddystone formers 2 1/2in dia, 26 turns, £10. AVOMinor, £10. Two 7MHz antenna traps, new, £10. Hamgear pre-selector 1.6-32MHz 240V, £10. G3OXY, QTHR. Tel: (0327) 702265.

For Sale Normende Galaxy 25 multi-standard portable colour TV, v.h.f./u.h.f., PAL/SECAM 240Va.c./12Vd.c., remote control, little used as reviewed in *Short Wave Magazine*, £250. Tel: Burton-on-Trent (0283) 33161.

For Sale GE oscillator units, power supply 5-920MHz, £25. Bush DAC10 1950 full working order, £35. 8-ele 144MHz Yagi, £10. Wayne Kerr oscillator S121 10 - 120Hz with handbook, £15. G3OXV, QTHR. Tel: (0327) 702265.

For Sale Sony ICF SW7600D communications receiver, very little used, v.g.c. with earphones, mains p.s.u. and long wire antenna, boxed with instruction book, £135 inc p&p. G0RZI, Cumbria. Tel: (0946) 812092.

For Sale Kenwood 231E 144MHz mobile, £200. Kenwood 431E 430MHz mobile, £245. 531E 1296MHz mobile, £300. All as new - base use only. Kam t.n.c. (v5.0 Eprom available), £195. Paul G4XHF. Tel: (0293) 515201.

For Sale Panasonic RF3100 32-band radio, £120 inc p&p. Zenith 3000 and R-7001, offers for the two, both in good condition. Diamond D130N discone antenna for wideband reception, £50, buyer collects. Tel: (0695) 28945.

For Sale Freehold QTH semi-detached house, near shops, 3 bed, bath, small garden, 2 rec rooms. Holbeach, Lincs, £28,950 for very quick sale, OAP selling for health reasons. Tel: (0406) 22649 after 6pm.

Exchange HT-106 sidebander plus pre-amp and combined 4/6m Yagi for 144MHz

multi-mode or good 144MHz sidebander. Tom Burke G1LXU, Cleethorpes. Tel: (0472) 602335.

For Sale SX200 scanner, £110. TF200 f/coupler, £90. Bird Wattmeter to 1.26GHz, £90. Rotator, £20. 88-element 70cm Jaybeam, £20. Pye u.h.f. mobile (modern), £50. Tandy 200 l.c.d. computer with c.w., i/o ports, £150. Datong Morse tutor, £30. 165MHz mobile, synth, easy converted, £25. Tel: Edinburgh 031-663 2633 ask for Alastair.

For Sale Yaesu FT-290R multi-mode transceiver with accessories. Microwave linear amplifier MML 144/100LS. Toyo s.w.r. meter 144/430MHz, 12-element ZL special antenna with rotator. All in good condition, £300 the lot. Tel: (0562) 515305.

Exchange IC725 and FT-290R both in excellent condition, for 144/430MHz multi-mode base. Will consider 144MHz mm base with 430MHz mobile or hand-held, any suggestions? Tel: (0594) 542146 evenings.

For Sale Jaybeam Minimax tribander beam, Clark PT4 pump-up mast 8-40ft, field type complete, CDE rotator, Hobby air compressor, offers? David Wright G4BKE, Broadstone, Poole. Tel: (0202) 697338.

Exchange Trio 9130 25W 144MHz multi-mode mobile, fist mike, MC 60A base mike, two mobile mounting brackets, two power leads, workshop and operator's manuals, 12-element ZL special 144MHz beam, 3 x 5/8 wave 144MHz vertical collinear antenna, home-brew 144MHz a.t.u. and Tandy antenna rotator (needs proper controller), for Icom 725 or similar h.f. transceiver. John G4XPP, QTHR. Tel: (0388) 745787 after 6pm.